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POPULATION ESTIMATION AND ECOLOGY OF THE TIGER IN SUNDARBANS

1. INTRODUCTION

1.1 Monitoring tigers is a process, the end product of which is not just the numbers but an indication that there has been a change in the number of tigers with an understanding of the factors that would have been responsible for the change (Jhala and Qureshi, 2004). Though general methods for estimating tiger numbers and quantifying prey base are available, the same cannot be applied to Sundarban mangroves, nor can they be used as tool for monitoring. Sundarbans as a unique tiger habitat deserves special attention for designing survey and monitoring protocols specific to the special conditions prevailing there.

1.2 The mangrove habitat of Sundarbans provide a formidable challenge for conducting a scientific study owing to ever present threat from tigers, absence of roads and trails inside the forests and difficulties in employing standard survey methodologies which usually perform well in other habitats. The proposed study in the Sundarban Tiger Reserve will attempt to overcome such limitations and develop an effective monitoring system so that we can keep a pulse of tigers in this unique mangrove habitat. With these objectives in mind, preliminary fieldwork was carried out for five months beginning from March 2006 to July 2006. The main emphasis was to understand the landscape, carry on groundwork to facilitate the radio-collaring of tigers, evaluate the use of camera traps in this unique landscape and to understand the limitations of survey methodologies. Based on the preliminary survey, the methodology was further refined.

1.3 However a major challenge in Sundarbans is to understand the ecology and behaviour of tiger itself. It need not be overemphasized that it is important to understand home ranges, movement patterns, habitat use and preference of tigers in this unique mangrove ecosystem. Second major challenging task is to generate reliable estimate of population and to design an effective yet simple protocol for monitoring. Since it is not possible to do much on-ground work due to inhospitable terrain, ever-present threat from tigers and dense mangrove vegetation, radio-telemetry is the only viable option for generating maximum amount of good quality data. Following is a brief overview of methodology to be followed.

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2. Prey Monitoring/Estimation:

2.1 Since it is not possible to sample unbiased foot transects in Sunderbans and sampling is done on water channels (convenience sampling) it may not be appropriate to extrapolate prey densities for the sampled census block to obtain absolute number of ungulates. However, the methodology would still be appropriate for monitoring population trends and for estimating relative densities. The WII team along with the FD staff will sample the channel transects. Sighting distances (perpendicular) will be recorded using laser range finders. This data will be used to model effective strip widths of the channel transects. Simultaneously the channel transect shores will be searched for sign encounter rates. Attempt will be made to establish correlations between estimated prey densities and prey signs.

3. Tiger Population Estimation:

3.1 Due to the limitations of working in the Sunderbans there is no single clear cut method for estimating the tiger population. All the approaches proposed here would need to be tested in an experimental framework.

3.2 If a reasonable number of tigers are radio-collared with a specific design in a limited area, it would be theoretically possible to use these collared tigers in a Mark-Recapture framework for estimating population size of the tigers in that area of the Sunderbans. If intensive trapping of tigers is done in a small area (100-200 km^2) for radio-collaring or management purpose and photographic record of their stripe patterns (head and both flanks) is kept (along with age and gender), it would be possible to use this information for estimating the population of tigers in that area.

3.3 Due to the unique nature of the tidal washing of the mangrove, there are naturally created strips of mud flats that are ideal for recording tiger pugmarks. These mud strips are regularly washed by the changing tide condition every day. Tigers regularly cross these mud strips of channels and creeks to commute between mangrove forest patches. Thus the density and decay rates of tiger pugmark sign can easily be estimated in the Sunderban habitat. With radio-collared tigers it would be possible to estimate the pugmark sign deposition rate based on the daily movement rates and paths of tigers (from a reasonable number of collared tigers). Once these parameters (sign density, sign deposition and sign decay rates) are estimated, it would be possible to estimate the tiger density in the different areas of the Sunderbans.

3.4 All of the above proposed methods require data from radio-collared tigers. Thus, the phase III for tiger density estimation is dependent on timely deployment and reasonable number of radio-collars deployed on tigers in the Sunderbans. **A minimum of 10 tigers would be required to be radio-collared, 4-6 (3-4 females and 2-3 males) in a contagious area of 200-300 km^2 and 4-5 tigers in other areas of park**. Such a design will be crucial to collect data on an intensive

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level from one area and also to get a good representation of all the ecological strata in Sundarbans. We shall attempt to use the latest technology collars where duty cycle of the GPS as well as the ARGOS communication can be programmed remotely. This would permit us to obtain intensive location data (GPS locations every 20-30 minutes) for sampling movement patterns for sign deposition during continuous monitoring phase and switch to the more conventional 4-8 locations per day schedule for obtaining home-range and habitat use data with a reasonable battery life remaining on the collar. The sign deposition, sign density and sign decay method of population estimation likely has the best potential due to the ease of estimating these parameters and wider application across the Sunderbans. However, it must be noted that these are all experimental approaches that would require a minimum of 3-5 years of data to evaluate and apply.

3.5 Human tiger conflict is a cause of major concern in Sundarbans. Tigers are frequently found to stray out to villages, resulting in livestock depredation, panic among local people and sometimes human mortality all of which leads to conflict and hampers public support for conservation. Tigers that disperse outside of the Tiger Reserve into human settlements are regularly captured by the Tiger Reserve Management and released back into the Reserve. If permissions for radio-collaring sufficient number of tigers are granted, we can utilize this opportunity to radio-collar such animals before they are released back to the forest. This would increase our understanding of behaviour of such tigers, reasons of their straying out and may be possible causes of man-eating nature. Data thus generated would be very useful for park management for mitigation of conflict and reducing unfortunate incidents of man-eating. Photographic records of the head and both flanks of these captured tigers along with age and gender need to be recorded. Tigers can be reliably aged by examining the wear and size of their teeth, whenever, possible photographs of the tigers teeth should be taken (often this is possible when a non anesthetized tiger growls or snarls at the observer). The above data set will provide invaluable information on dispersal, population structure, and an understanding of the problem for management purposes.

4 Estimating Home Range, Daily Movement, and Habitat Use

4.1 As it is not possible to do ground tracking of tigers in Sundarbans, we plan to deploy GPS-PTT collars to collect information on home range, daily movement and habitat use by tigers. We have proposed use of GPS collars as they are very effective in providing large number of locations. Keeping in mind the conditions prevailing in Sundarbans, we intend to use radio-collars with two way communications where the researcher can communicate with the radio-transmitter while on the animal through a hand held unit. Thus we can program the collars in field in a real time situation and vary the intensity of the data collection, download time etc depending upon the requirements. For example we can program the collar to collect GPS locations at very short intervals to chart out exact movement patterns of tiger in the mangroves and thus compensate for not being able to ground track the tigers. Similarly PTT will help us to keep a track on tigers even if they range over large areas and contact by VHF is lost.

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5. Significance:

5.1 The research is essential to determine the status of the tiger in the Sundarban Tiger Reserve. It is a part of the Phase III of the all India Tiger Monitoring Exercise undertaken by the NTCA. Due to the unique habitat of the Sundarban the standard methods are unlikely to work and telemetry is an integral part of the tiger estimation methodology. Besides the project will provide important data on Phase IV, and in understanding tiger ecology in this unique habitat. The research will improve our understanding on ranging patterns, home ranges, territoriality, habitat use, and food habits of tigers in the Sundarbans. These elements are essential for policy decisions and management of the tiger reserve for ensuring the long term survival of the tiger in the Sundarbans.

6. Budget

(Rs. in Lakh)

Budget heads Cost in Lakh Rupees	Year I	Year II	
Fellowship & Wages (2 researchers & 3 field assistants + casual labour)	4.50	4.50	
Vehicle & Boat rental (Sep to May)	8.10	8.10	
Equipment (Telemetry, drugs, capture equipment, satellite cost, field supplies)	30.00	12.00	
Travel	1.50	1.50	
Miscellaneous	1.00	1.00	
Subtotal	**45.10**	**27.10**	**Total=72.2 lakhs**

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